

THE 2002 CLOSURE OF RUSSELL FIORD, ALASKA - JUNE & JULY 2002

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For more than a century, Hubbard Glacier, the largest tidewater glacier in North America has been advancing towards the mouth of Yakutat Bay. Several times during the Holocene, Hubbard's terminus has blocked the entrance to Russell Fiord, a tributary of Yakutat Bay, forming 'Russell Lake.' The most recent closure occurred in May 1986, when a moraine, extruded from the floor of Yakutat Bay was pushed ahead of a narrow finger of advancing ice. Its contact with the fiord's bedrock wall initiated the closure. A similar event is underway.

By mid June, 2002, a several-kilometer-long length of the terminus had advanced to within 100 m of the south wall of Russell Fiord. More than a kilometer of this length had pushed and extruded subaqueous glacial and glacial-marine sediments until they emerged from the fiord, reaching a height of ~ 25 m above sea level. Adjacent to Gilbert Point, a triangular-shaped mass of this extruded sediment and moraine was pushed against ~ 125 m of the fiord wall. The surface of the moraine had four distinct ridges, all less than 8-m-high. Although the width of the entrance to the fiord had been decreasing for years, the development of the push moraine eliminated the tidal exchange of water with Yakutat Bay. In mid-June, fresh water continuously flowed out of Russell Lake through a ~ 90-m-long, shallow channel, with a width of ~ 20 m. The channel was cut into the top of the push moraine. Through mid-July 2002, the water level in Russell Lake rose ~ 0.2 m/d.

During the 1986 closure, freshwater accumulated in the lake at an average rate of > 450 m³/s. On October 7, 1986, the dam failed when the lake surface was 25 m above sea level. The outburst flood, with an average discharge of > 100,000 m³/s, was among the largest in North America since the draining of glacial Lake Missoula.

Between the 1986 event and June 2002, Hubbard Glacier's terminus advanced about 560 m. During June and the first-half of July 2002, as the height and complexity of the push moraine increased, the outlet channel continued to narrow. On July 16, the GSA Abstract deadline, the channel width was < 10 m. Although some fresh water continued to exit through the channel, the water level in Russell Lake approached 10 m above sea level. Continued moraine development and ice advance could result in a long-term closure of Russell Fiord.

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